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ORGANOCHLORINE PESTICIDES (OCPS) IN SEDIMENTS OF NORTHEAST COAST OF BORNEO SABAH AND SULU SULAWESI SEA, MALAYSIA

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Thesis Submitted in Fulfilment of the Requirement for the Degree of Master of Marine Science in the Faculty of Maritime Studies and Marine Science University Malaysia Terengganu 2013

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Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu
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PESTICIDES (ORGANOCHLORINE) AT NORTHEAST COAST OF BORNEO SABAH AND SULU SULAWESI SEA, MALAYSIA

NOORKHALISAH KHAMARUDIN

July 2013

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Co-Supervisor : Dr. Ahmad Shamsuddin Ahmad, Ph.D

Faculty : Maritime Studies and Marine Science

Study on organochlorine pesticides (OCPs) distribution in sediment was conducted at the Northeast coastal area of Sabah, including Pulau Mandidarah, Pulau Jambongan, Pulau Musa, Pulau Malawali, Pulau Tigabu, and stations at the Sulu Sulawesi Sea area. This study identified 17 organochlorine pesticides compounds consisted of alpha-BHC, lindane, beta-BHC, heptachlor, delta-BHC, aldrin, endosulfan I, 4,4'-DDD, heptachlor epoxide, 4,4'-DDE, dieldrin, endrin, endosulfan II, 4,4'-DDT, endrin aldehyde, endosulfan sulphate, and methoxychlor.

Overall, the highest OCPs compound detected was methoxychlor in the northeast coastal area and the Sulu Sulawesi Sea area with the concentration of 21.01 ng/g in Sulu and 15.39 ng/g respectively, followed by 4,4'-DDT in the concentration of 1.54 ng/g and 1.70 ng/g respectively. The lowest concentration compound found in the northeast coastal area was endosulfan sulfate at 0.44 ng/g and the Sulu Sulawesi Sea area was delta-HCH compound at 0.39 ng/g. Beta-HCH and heptachlor was the

dominant compound found in all station of the northeast coastal area and the Sulu Sulawesi Sea area but at low level of 0.67 ng/g and 0.38 ng/g respectively. In this study methoxychlor was the highest concentrations at all stations, this may due to its physical and chemical properties and also from the surrounding areas. Overall, OCPs concentrations measured in the study area were low for DDTs, HCHs, and Cyclodiene compounds, making it still an unpolluted environment compared to sediment quality guideline, except for methoxychlor compound. Meanwhile, beta-HCH and heptachlor were also the dominant compounds found in all stations in study area. These compounds can be related to the environmental condition of the study area, such as the use of the coastal area and adjacent seas as dumping area for wastes such as agriculture waste, industrial waste, runoff and increasing urbanization, industrialization and tourism activities.

Total organic carbon (TOC), sedimentological characteristics analysis are mean size, percentage of clay and sediment texture were analyze in this study. The relationship between TOC, OCP and sediment particle were done and it is related with the environment in this study area. The pattern of the textural classes of the sediment at the Northeast Coast of Sabah and Sulu Sulawesi Sea showed there are majority on fine sand and silty clay type, respectively. These indicate that the sediment was originated from the terrigenous and lithogenous sources.

Keywords: Pesticide; Organochlorine, Northeast Coast Sabah, Sulu Sulawesi Sea.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk Ijazah Master Sains (Marin Sains)

ORGANOKLORIN PESTISID PADA PANTAI TIMUR LAUT BORNEO SABAH DAN LAUT SULU SULAWESI, MALAYSIA.

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Julai 2013

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Kajian racun perosak organoklorin (OCPs) dalam sedimen telah dijalankan di kawasan pantai Timur laut Sabah, termasuk Pulau Mandidarah, Pulau Jambongan, Pulau Musa, Pulau Malawali, Pulau Tigabu, dan stesen di kawasan Laut Sulu Sulawesi. Kajian ini mengenal pasti 17 sebatian organoklorin racun perosak yang terdiri daripada alpha-BHC, lindane, beta-BHC, heptaklor, delta-BHC, aldrin, endosulfan I, 4,4'-DDD, heptaklor eposida, 4,4'-DDE, dieldrin, endrin, endosulfan II, 4,4'-DDT, endrin aldehid, endosulfan sulfat, dan metosiklor.

Keseluruhannya, spesis OCPs yang ditemui tertinggi adalah metosiklor di kawasan pantai dan Laut Sulu Sulawesi dengan kepekatan 21.01 ng/g dan 15.39 ng/g masing-masing, diikuti oleh 4,4'-DDT masing-masing dalam kepekatan 1.58 ng/g dan 1.70 ng/g. Kepekatan terendah sebatian yang ditemui di kawasan pantai adalah endosulfan sulfat pada 0.44 ng/g dan di kawasan Laut Sulu Sulawesi adalah spesis delta-HCH pada 0.39 ng/g. Beta-HCH dan heptaklor adalah sebatian dominan yang ditemui di semua stesen di kawasan pantai dan kawasan Laut Sulu Sulawesi tetapi dengan tahap yang rendah iaitu 0.67 ng/g dan 0.39 ng/g masing-masing. Penemuan

dalam kajian ini adalah kepekatan metosiklor yang didapati tertinggi di semua stesen dan ini disebabkan oleh sifat fizikal dan kimianya dan juga dari kawasan persekitaran. Secara keseluruhannya, kepekatan OCPs yang diukur di kawasan kajian adalah rendah untuk DDTs, HCHs, dan sebatian cyclodiene, menunjukkan ia masih dalam persekitaran yang tidak tercemar dibandingkan dengan garis panduan kualiti sedimen, kecuali bagi sebatian metosiklor. Sementara itu, beta-HCH dan heptaklor juga sebatian yang dominan ditemui di semua stesen di kawasan kajian. Sebatian-sebatian ini boleh dikaitkan dengan keadaan alam sekitar kawasan kajian, seperti penggunaan pesisiran pantai dan laut bersebelahan sebagai lambakan kawasan untuk sisa seperti sisa pertanian, sisa industri, air larian dan pembandaran yang semakin meningkat, perindustrian dan juga aktiviti pelancongan.

Organik karbon, sifat sedimen dan ciri-cirinya termasuklah purata saiz, peratus tanah liat dan tekstur enapan telah ditentukan dalam kajian ini. Hubungan antara TOC, OCP dan zarah sedimen telah dilakukan dan ia berkaitan dengan kawasan kajian ini. Corak kelas tekstur sedimen di Pantai Timur Laut Sabah dan Laut Sulu Sulawesi menunjukkan keseluruhan adalah pasir halus dan jenis tanah liat berkelodak, masing-masing. Ini menunjukkan bahawa sedimen telah datang dari sumber daratan (terrigenous) dan lithogenous.

Kata kunci: Pestisid; Organoklorin, Pantai Timur Laut Borneo Sabah, Laut Sulu Sulawesi